

UNLICENSED WIRELESS BROADBAND OPERATION IN THE TV BROADCAST BANDS

On May 25 the FCC released the text of the *Notice of Proposed Rule Making (NPRM)* in ET docket Nos. 04-186 and 02-380, which proposes to allow unlicensed broadband operations on vacant TV channels (See last weeks TV Techcheck for back ground). Here are some of the details of the Commission's proposal.

The *NPRM* states that unlicensed broadband devices would share spectrum with broadcast TV and other licensed services. Therefore, they will need to have capabilities to avoid causing harmful interference to those licensed services. Specifically, an unlicensed device would need to have the ability to determine whether a TV channel or frequency band is unused before it could transmit. In addition, an unlicensed device may need the capability to cease operating on a frequency band in the event a licensed user wishes to commence transmissions on a channel that was previously vacant. The *NPRM* states that this capability is especially important in light of the transition to DTV, because many broadcasters may be required to change their current DTV channel and new DTV stations may begin operation.

The *NPRM* discusses the requirements for two different types of unlicensed operations in the TV bands. The first type involves the use of wireless portable computing devices, such as laptops and PDAs, wireless home and local area networks (LANs), and other short-range applications within a home or a business. The second type of operation involves the provision of broadband services to homes and businesses. This type of operation would use higher power transmitters primarily used outdoors in fixed locations. These "Fixed/Access" installations may cover a substantial geographic area, and may be part of a commercial service infrastructure. These two types of operations may also be used together. For example, a wireless Internet Service Provider (WISP) could provide broadband service to laptops and PDAs using a high gain receive antenna for reception from portable/personal devices. The Commission has proposed slightly different interference avoidance requirements for these two different types of unlicensed broadband applications.

Unlicensed Personal/Portable Operations

- The maximum transmitter power output would be limited to 100 milliwatts (mW) and they would be required to have a permanently attached integral antenna with a maximum permissible gain of 6 dBi.
- Would be required to automatically and periodically transmit a unique identification signal so that it could be found should interference occur.
- Would be allowed to transmit only after receiving a "control" signal that positively identifies which TV channels are vacant and therefore available for use. If the portable device does not receive this "control" signal, it would not be permitted to operate. This would provide positive assurance that these devices would operate only on unused TV channels. The FCC proposes to permit the transmission of control signal data by a number of sources such as the transport stream from a digital TV station, VBI data from an analog TV station, subcarrier data from an FM radio station, data transmitted by a licensed wireless provider, or channel availability data from a fixed/access unlicensed device.

Fixed/Access Unlicensed Devices

- Could have a transmitter output power of up to one watt and could use higher gain directional antennas, but with requirements for transmitter output reductions for antennas with gains above 6 dBi.
- These devices must also automatically and periodically transmit a unique identification so that any harmful interference situation, should it occur, can be quickly identified and remedied

- The *NPRM* proposes to require that such devices incorporate a method for determining its geographic location with a minimum accuracy of 10 meters using, for example, GPS technology. Using this location information, local broadcast station data and the protection requirements shown in the table below, channel availability for the unlicensed device can be determined. These devices would therefore be required to have the capability to access a database that contains TV station information and have the appropriate computational software to determine which TV channels are available for unlicensed use based on its location. As an alternative, the FCC proposes to require that the unlicensed device be professionally installed by a party that would be responsible for insuring that the transmitter would only operate on vacant TV channels.


Technical Criteria for Determining When a TV Channel Can be Considered Vacant

The *NPRM* proposes that the requirements needed to protect television service from digital unlicensed devices should be limited to co- and adjacent channel operations only for fixed/access operations. For personal/portable operations, the FCC believes that the potential for harmful interference to adjacent channel television operations is sufficiently low that there is no need to impose adjacent channel restrictions on these devices. Therefore these devices will be required to provide protection to co-channel operations only. The D/U ratios are shown in the table below:

Type of Station	Protection Ratios		
	Channel Separation	D/U Ratio (dB)	Propagation Curve
Analog TV, Class A, LPTV, Translator and Booster	Co-channel	34	F(50,10)
	Upper adjacent	-17	F(50,50)
	Lower adjacent	-14	F(50,50)
Digital TV and Class A	Co-channel	23	F(50,10)
	Upper adjacent	-26	F(50,50)
	Lower adjacent	-28	F(50,50)

The *NPRM* proposes to require that these service and protection criteria be used in conjunction with appropriate computational software, including use of the Commission’s propagation curves, and a television station engineering database to develop the control signal information on available channels for unlicensed personal/portable devices and for coordination and deployment of unlicensed fixed/access devices. Under this approach, the computational software would calculate field strengths along a line determined by the locations of the TV transmitter and the unlicensed device. The field strength of the TV station (D) would be calculated using FCC curves and the licensed technical parameters of the station, *i.e.*, power, antenna height and antenna characteristics. The field strength of the unlicensed device (U) would be computed using the appropriate maximum power of the device and an assumed antenna height of 2 meters for portable/personal devices and 10 meters or the actual installed antenna height above ground, whichever is greater for Fixed/ Access stations.

The *NPRM* states that in doing these calculations, the field strengths within 10 meters of the unlicensed device may be ignored since it could be assumed that this region would be under the unlicensed operator’s control. At all points on the line segment from the TV transmitter to the edge of the TV station’s protected contour, the D/U ratio would be calculated and compared to the minimum D/U protection ratios set forth above. (Note: Calculation of field strengths for distances less than 1.5 km should be based on free space propagation; calculation of “undesired” field strengths for distances between 1.5 km and 15 km should use the F(50,50) charts because the F(50,10) charts are valid only for distances of 15 kilometers or greater.) The calculations would yield a distance from the TV transmitter within which adjacent channel operation would be permitted and a distance beyond the edge of contour where both co- and adjacent operations would be acceptable.



For more information on NAB’s 2004 Satellite Uplink Operators Training Seminar
<http://www.nab.org/sci/tech/satsem2004.asp>

The *NPRM* seeks comment on all the proposals and also asks for suggestions on how to ensure that no interference is caused to TV broadcasters. A copy of the *NPRM* is available on the FCC web page at http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-04-113A1.pdf.